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Effects of atmospheric argon plasma treatment on surface decontamination of carrots

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In this study, surface decontamination efficiency of atmospheric argon plasma (AAP) treatment was examined on *Escherichia coli* ATCC 25922 inoculated carrots. The susceptibility of minimally processed carrots to microbial deterioration limits their shelf life and marketability. Increased consumer awareness on the demand for healthy foods prompted the food industry to develop alternative methods that ensure the microbiological safety of minimally processed foods while preserving original quality characteristics. In this context, atmospheric plasma treatment represents a potential alternative to traditional methods for non-thermal decontamination of foods. *E. coli* ATCC 25922 cultures were spray inoculated on peeled carrot surfaces. Inoculated carrots were treated with AAP for 10, 30 or 60 s at a working distance of 10, 20 or 30 mm, respectively. After the plasma treatment, *E. coli* counts were determined via pour plate method. During the plasma treatment surface temperature of the carrots were measured by the thermal camera. The effect of AAP on microscopic morphology was examined by Scanning Electron Microscopy (SEM). AAP surface decontamination efficiency significantly increased with lower working distance and longer treatment times. The highest reductions of *E. coli* count on carrot surfaces were achieved at 60 s treatment time for all working distance parameters. The maximum reductions were recorded as 4.54, 1.84 and 1.56 CFU/sample, for 10, 20 and 30 mm working distances, respectively. The most effective parameter in decontamination of carrot surfaces was found 10 mm working distance and 60 s working time. During the AAP treatment surface temperature of carrots didn't exceed 40°C. SEM results showed that bacterial cell wall integrity was disrupted after the plasma treatment causing cell death. This study demonstrated that the AAP treatment can be used as an efficient alternative process to traditional non-thermal decontamination methods for surface decontamination of carrots.

Biography

Ufuk Bagci was graduated from Department of Food Engineering, Hacettepe University, Turkey in 2000. He has obtained his MSc degree in 2006 and PhD degree in 2012 from the same department. He worked as a Research Assistant at Hacettepe University from 2003-2012 and; an Engineer at the Ministry of Food, Agriculture and Livestock, European Union and International Relations General Directorate from 2012-2014. During his term at the Ministry, he worked as a Technical Expert in a FAO-Turkey project. He is now working as an Assistant Professor at Trakya University Turkey, Department of Food Engineering since September 2014. His main interests are in Food Pathogens, Lactic Acid Bacteria, Probiotics and Food Security. He is also interested in membrane separation and cold plasma technologies.

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